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GB 2083162 A US 4348133 A US 3704861 A

(58) Field of Search

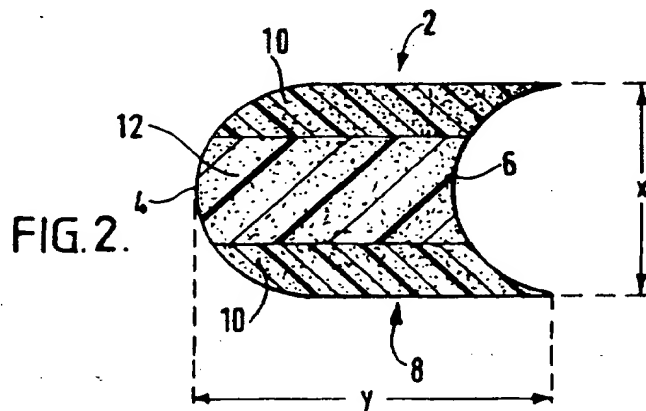
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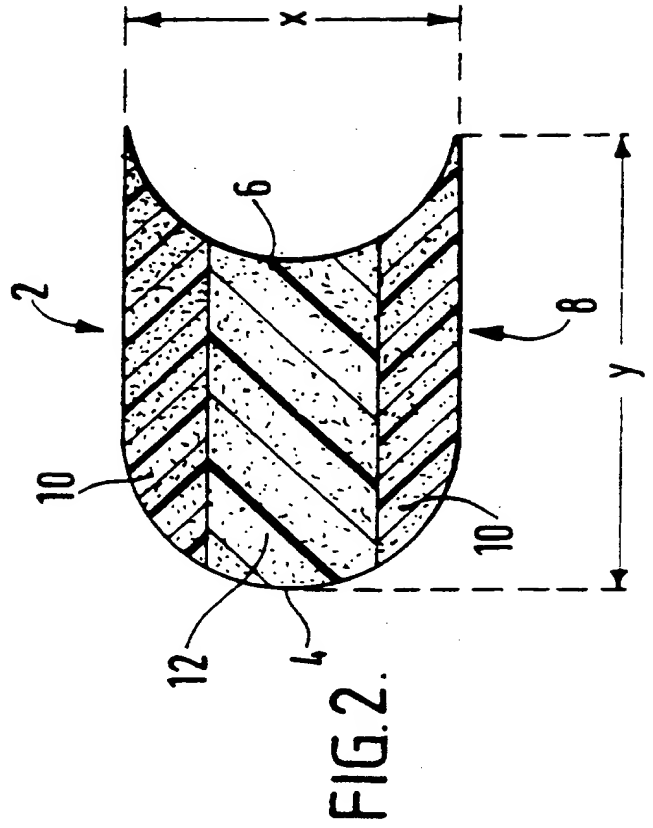
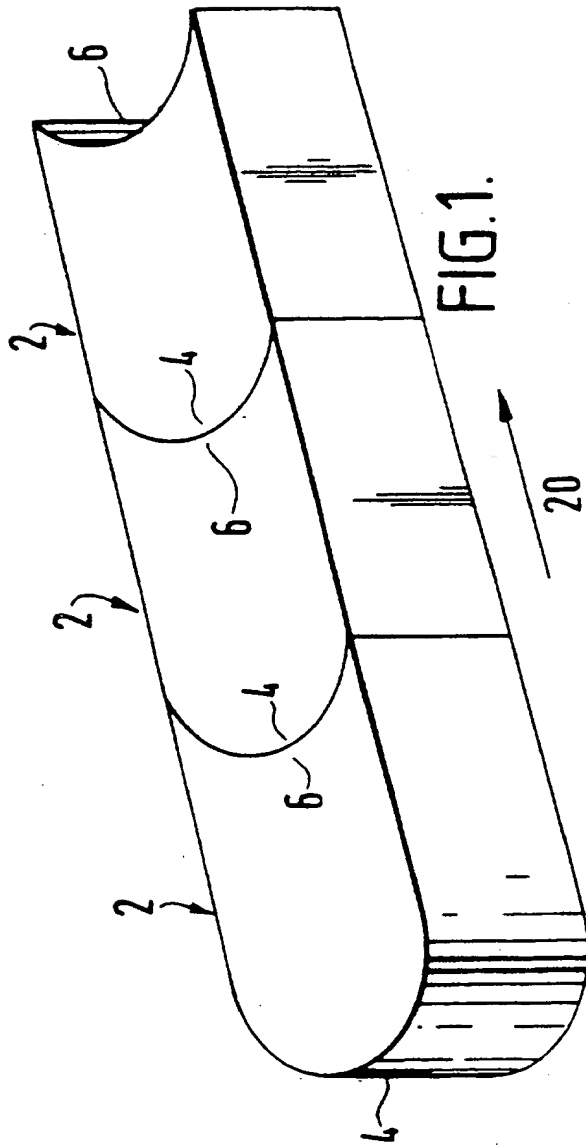
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## (54) Crash barrier

(57) A crash barrier suitable for motor racing circuits comprises a multiplicity of crash barrier elements 2 which are engaged with one another. Each element includes an outer PVC cover. In one embodiment, the cover encloses a foam inner member which comprises an outer reconstituted foam region 10 and an inner foam region 12. In another embodiment, the cover encloses an inner foam region which is covered by a laminar sheet material. A crash barrier constructed from a multiplicity of elements placed end to end has been found to be efficient in absorbing vehicle impacts.



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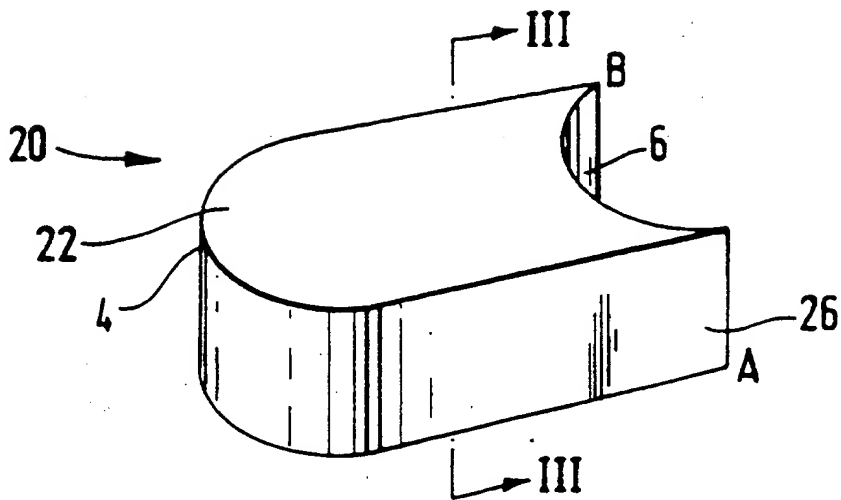


FIG. 3.

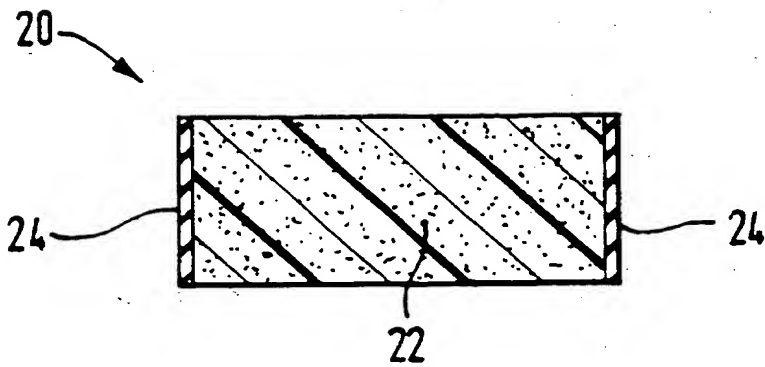


FIG. 4.

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CRASH BARRIER

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5 This invention relates to a crash barrier and particularly, although not exclusively, relates to a crash barrier for use at motor racing circuits.

10 Known types of crash barriers used at motor racing circuits include barriers made from used tyres which are arranged to define a tyre "wall" which will absorb some impact if hit by a vehicle. Additionally, it is known to provide water filled containers which are also arranged to absorb impact if hit. The known crash barriers are relatively ineffective if hit by a vehicle at high speed and this can lead to serious injuries for the driver of  
15 the vehicle.

Some motor racing circuits are also surrounded, at least in part, by unprotected concrete walls. If a vehicle crashes into such a wall, the wall absorbs little impact  
20 of the collision and, accordingly, the vehicle and also the driver may be severely damaged.

It is an object of the present invention to address problems associated with known crash barriers.  
25

According to the invention, there is provided a crash barrier element comprising an outer region and an inner region, wherein the outer region and inner region have different properties.  
30

Said outer region is preferably non-metallic. Said outer region is preferably at least partially resilient. Said outer region may be elastic. Said outer region is preferably flexible. Said outer region is preferably deformable and/or compressible. Said outer region is  
35

preferably secured relative to the inner region. Adhesive means is preferably provided for bonding the outer region to said inner region.

5           Said inner region preferably defines an impact absorbing region. Said inner region is preferably resilient. Said inner region may be elastic. Said inner region is preferably flexible. Said inner region is preferably compressible. Said inner region is preferably  
10           made, at least in part, of a foam material.

          In a first embodiment the outer region may be made out of a foam material. Said foam material is preferably a reconstituted foam material. A preferred foam material  
15           is polyurethane foam. Said outer region preferably overlies part of said inner region. More preferably, said outer region overlies said inner region along the length thereof. The inner region is preferably made out of a foam material. Said foam material is preferably a first  
20           generation foam material. A preferred foam material is polyurethane foam. Preferably, said outer and inner regions comprise separate pieces of material that are secured relative to one another. As an alternative, the first and second regions may be formed in a single  
25           moulding process, by causing the mass of material during the moulding process congregating in selected regions of the mould to differ. Where the outer region and inner region are made out of a foam material, preferably said outer region is more dense than said inner region.  
30           Preferably, the outer region and the inner region have different hardness. Preferably, the outer region is harder than the inner region. The crash barrier element may comprise two outer regions, between which regions said inner region is disposed.

In a second embodiment, said outer region may comprise a load distributing layer for spreading an impact laterally. Preferably, said outer region is thinner than said inner region. Said outer region may comprise a cover  
5 for part of said inner region. Said outer region preferably comprises a laminar sheet material. Said outer region may comprise a laminate. One layer of such a laminate is preferably resilient, for example it may comprise a rubber or rubber-like material, and one layer  
10 may be a strengthening layer, for example it may comprise a woven textile material. Said outer region may have a thickness in the range of 1mm to 20mm, preferably in the range 2mm to 10mm, more preferably in the range 3mm to 8mm. Preferably, said outer region and said inner region  
15 are secured relative to one another, suitably by adhesive means.

Preferably, said outer and inner regions of said crash barrier element define an inner member which is  
20 covered by a covering means. Said covering means preferably wholly encloses said inner member. Said covering means is preferably substantially waterproof. Said covering means is preferably flame retardant. Said covering means may comprise a synthetic plastics material,  
25 for example PVC. Reinforcement means, for example in the form of a nylon or polyester sheet material, may be arranged to reinforce the PVC.

Said crash barrier element is preferably arranged to  
30 abut another crash barrier element which is the same as the crash barrier element described above. Preferably, said crash barrier element includes a male element, suitably at one end, and a female element, suitably at the other end, wherein the male and female elements are  
35 arranged to engage respective female and male elements of

other crash barrier elements. Said male element preferably includes a convex region and said female element includes a correspondingly shaped concave region.

5        Said crash barrier element is preferably elongate and has an axis of elongation. Said element is preferably symmetrical about its axis of elongation.

10        In said second embodiment described above, said outer region preferably overlies sides of said crash barrier element, between said male and female elements. At least one of said male or female elements may include an outer region as described. Preferably, said male element includes said outer region. In this event, said out r  
15        region may extend substantially uninterrupted around said crash barrier element, but excluding said female element.

20        Said crash barrier element preferably has a length of at least 0.75m and less than 3m. Preferably, the length is in the range 1m to 2.5m and, more preferably, in the range 1.5m to 2.5m. The height of the element is preferably greater than 0.5m and less than 2.0m. Preferably, the height is in the range 0.5m to 1.0m. The width of the element is preferably greater than 0.5m and less than  
25        2.0m. Preferably, the width is in the range 0.7m to 1.2m.

Said crash barrier element may include means for securing said element to a second crash barrier element.

30        The invention extends to a crash barrier comprising a plurality of crash barrier elements of the invention.

35        Adjacent crash barrier elements preferably abut one another. Preferably, transversely extending ends of the crash barrier elements abut one another.

The elements may be secured together by suitable means.

5 The invention further extends to a method of constructing a crash barrier, the method comprising abutting a plurality of crash barrier elements of the invention.

10 Specific embodiments of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

15 Figure 1 is a perspective view of a length of a crash barrier, showing three barrier elements;

Figure 2 is a cross-section through a barrier element, with a cover of the element removed.

20 Figure 3 is a perspective view of another crash barrier element; and

Figure 4 is a cross section along the III-III of figure 3.

25 The length of crash barrier shown in Figure 1 comprises three barrier elements 2 which are engaged with one another. Each element 2 includes a convex end region 4 and a concave end region 6, the end regions 4, 6 being of corresponding shapes so that the convex region 4 of one  
30 element can be snugly received in the concave region of another element, as shown in the figure.

Each barrier element 2 comprises an outer PVC cover which completely encloses an impact absorbing foam region  
35 8 of the element. The PVC cover is arranged to act as a



protective layer to prevent, for example water and oil, contacting and penetrating the foam region. Also, the PVC cover is fire retardant. The PVC cover may be suitably coloured or emblazoned with advertising material.

5

The foam region 8 is as shown in Figure 2 and is of constant cross-section. The region 8 comprises outer foam regions 10 which extend along opposing sides of an inner foam region 12.

10

The outer foam regions 10 are each made out of reconstituted polyurethane foam. The foam suitably has a density in the range of 5 - 14 lb/ft<sup>3</sup> (80 - 224 kg/m<sup>3</sup>). Preferably, the density is about 9 lb/ft<sup>3</sup> (144 kg/m<sup>3</sup>).

15

The inner foam region 12 is made out of first generation polyurethane foam. It suitably has a density in the range 21 - 60 kg/m<sup>3</sup> (measured according to British Standard 4443 Part 1, method 2 (1988)), more preferably in the range 25 - 40 kg/m<sup>3</sup>. The hardness of the foam is suitably in the range 55 to 195N (measured according to British Standard 4443 Part 2, method 2 (1988)).

20

It should be noted that the outer foam regions 10 are generally harder than the inner foam region 12.

25

The foam regions 10 (and, accordingly, the element 2) suitably has a width "x" of about 1.0 metre; a maximum length "y" of about 2.0 metres; and a height of about 0.7 metres.

30

The weight of each element 2 may be in the range 65 - 150 kg.

It will be noted from figure 2, that the element is symmetrical about its elongate axis.

5 Elements 2 may be used to construct a crash barrier of any selected length by positioning a suitable number of elements in end to end engagement, as shown in Figure 1. The crash barrier, may for example be placed in front of a concrete wall which surrounds a racing circuit, with one side of the element 2 abutting the wall. Alternatively,  
10 the crash barrier may replace an existing tyre wall.

The crash barrier is arranged so that the convex end regions 4 of the elements face the direction 20 of travel of vehicles round the racing circuit.

15

Although not shown in the figures, an end block may be provided which is arranged to engage the unoccupied concave end region 6 shown in figure 1. The end block may have a square or concave outwardly facing region.

20

The crash barrier is arranged to provide a firm resistance to a narrow angle vehicle impact, but to deform progressively when hit from more severe angles, up to a maximum deformation at head on impact.

25

More particularly, when a vehicle hits the barrier at a narrow angle, the vehicle will be deflected after some of the force of the impact has been absorbed by the outer foam region 10 which is closest to the vehicle. For  
30 narrow angle impacts along the length of the barrier, little of the force of the impact will be absorbed by the inner foam region 12. However, for more severe angles up to a head on impact, the inner foam region 12 will absorb more and more of the impact. For a head on impact at 90°  
35 to the barrier, the outer foam region 10 will delaminate

and some of the impact force will be absorbed as a result of this. More of the impact force will then be absorbed by the inner foam layer 12.

5           The crash barrier element 20 shown in figures 3 and 4 has the same general shape as the crash barrier 2; however, it has a different construction. In this respect, element 20 has a polyurethane foam inner region 22 of a single density and type which is covered by a  
10 sheet material 24. The material 24 is adhered to the side 26 of the element and extends from position A to position B via convex end region 4. Concave end region 6 is uncovered.

15           The material 24 may comprise a ply reinforced rubber belting material of a type which is usually used for conveyor belt surfaces. Such a material comprises a laminate which includes a rubber layer and a reinforcing layer or layers of for example a textile fabric material  
20 such as woven cotton or nylon. The material is flexible and elastic. The thickness of the material used may be in the range 3-10mm.

          The element 20 may be enclosed in a protective PVC  
25 cover as described above.

          A crash barrier is assembled using a plurality of elements 20 as described above. In vehicle impact tests, the barrier has been found to perform well. More  
30 particularly, it is found that, when a vehicle hits the barrier, the material 24 tends to spread the force of impact laterally so that a greater volume of inner region 22 is used to absorb the impact. Furthermore, the material 24 aids the recovery of an impacted element and,  
35 therefore, may extend the useful life of the element.

It should now be appreciated that the elements 2, 20 may provide a versatile and effective means for constructing a crash barrier. The elements 2, 20 may be portable and may readily be moved to positions where they are required. In view of the symmetrical nature of the elements they may be used along either side of a track. Furthermore, since the elements may readily be made in bright colours and/or with designs thereupon, they may be more aesthetically acceptable compared to known concrete barriers or tyre walls.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any

novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any  
5 method or process so disclosed.

CLAIMS

1. A crash barrier element comprising an outer region and an inner region, wherein the outer region and the inner region have different properties.
2. An element according to claim 1, wherein said outer region is non-metallic.
3. An element according to claim 1 or claim 2, wherein said outer region is flexible.
4. An element according to any preceding claim, wherein said outer region is deformable and/or compressible.
5. An element according to any preceding claim, wherein said outer region is secured relative to the inner region.
6. An element according to any preceding claim, wherein adhesive means is provided for bonding the outer region to said inner region.
7. An element according to any preceding claim, wherein said inner region is flexible.
8. An element according to any preceding claim, wherein said inner region is made, at least in part, of a foam material.
9. An element according to any preceding claim, wherein said outer region is made of a foam material.
10. An element according to any preceding claim, wherein the outer region and the inner region have different hardness.

11. An element according to any preceding claim, wherein the crash barrier element comprises two outer regions, between which regions said inner region is disposed.

5 12. An element according to any preceding claim, wherein said outer region comprises a load distributing layer for spreading an impact laterally.

10 13. An element according to any preceding claim, wherein said outer region is thinner than said inner region.

14. An element according to any of Claims 1 to 8 or 10 to 13, wherein said outer region comprises a laminar sheet material.

15

15. An element according to claim 14, wherein one layer of said laminar sheet material is resilient and one layer is a strengthening layer.

20 16. An element according to any preceding claim, wherein said outer and inner regions of said crash barrier element define an inner member which is covered by a covering means.

25 17. An element according to any preceding claim, wherein said crash barrier element includes a male element at one end and a female element at the other end, wherein the male and female elements are arranged to engage respective female and male elements of other crash barrier elements.

30

18. An element according to any preceding claim, having a length in the range 0.75 m to 3 m, a height in the range 0.5 m to 2 m and a width in the range 0.5 m to 2 m.

19. A crash barrier comprising a plurality of crash barrier elements according to any preceding claim.

5 20. A method of constructing a crash barrier, the method comprising abutting a plurality of crash barrier elements according to any of claims 1 to 18.

10 21. A crash barrier element substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

15 22. A crash barrier substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

23. A method substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.



**Patents Act 1977****Examiner's report to the Comptroller under Section 17  
(The Search report)**Application number  
GB 9510938.5**Relevant Technical Fields**

(i) UK Cl (Ed.N) E1G (GLM)

(ii) Int Cl (Ed.6) E01F 15/00, 15/02, 15/04; 15/08

Search Examiner  
D HAWORTHDate of completion of Search  
28 SEPTEMBER 1995**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASE: WPI

Documents considered relevant  
following a search in respect of  
Claims :-  
1-23**Categories of documents****X:** Document indicating lack of novelty or of inventive step.**Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.**A:** Document indicating technological background and/or state of the art.**P:** Document published on or after the declared priority date but before the filing date of the present application.**E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.**&:** Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
X	US 4348133 A (TRENT)	1 and 2 at least
X	US 3704861 A (GLAESNER)	1, 2, 5, 8, 9
X	GB 2083162 A	1-10 at least

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